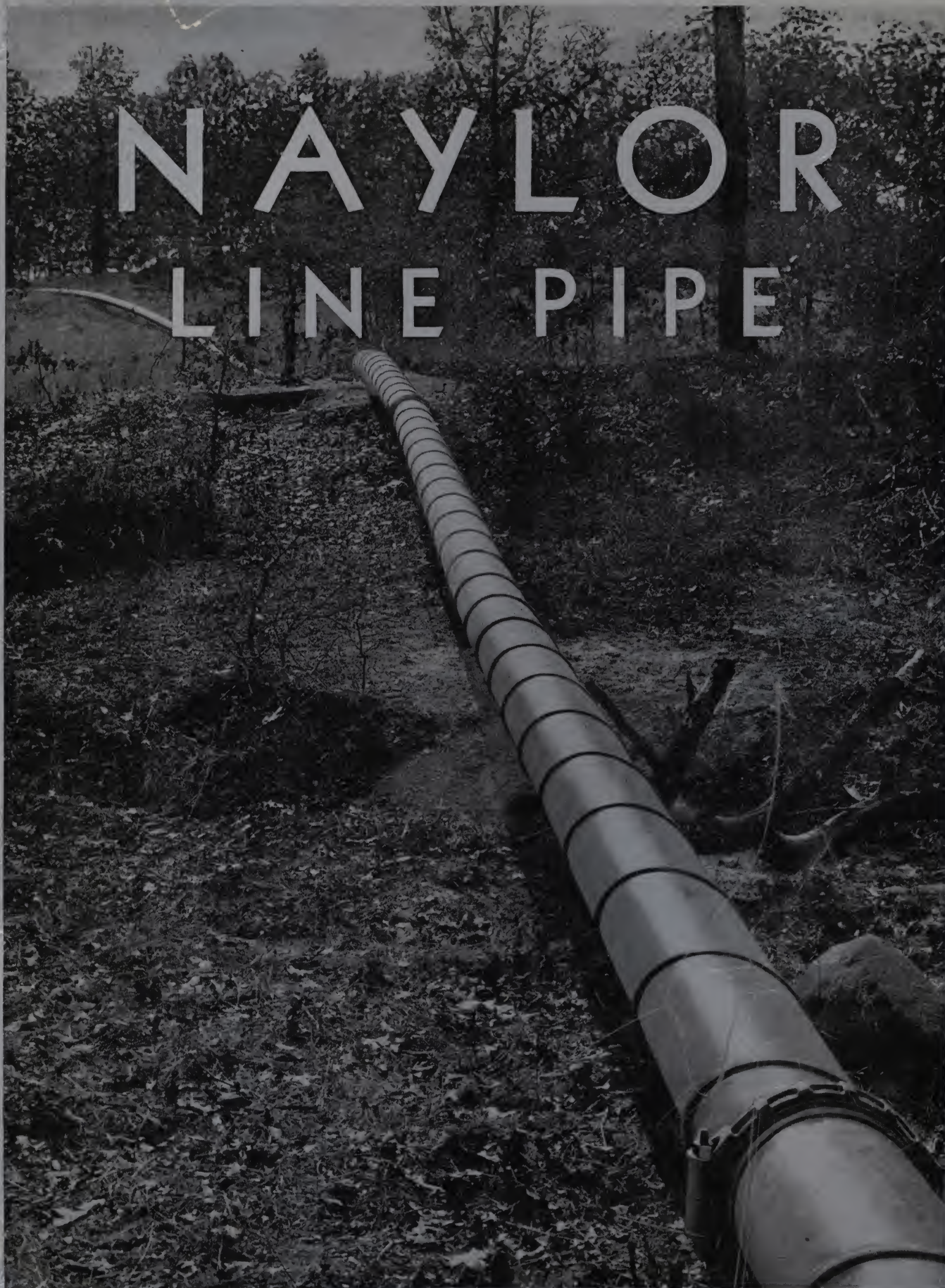


# NAYLOR LINE PIPE









Donor 98.45  
90.85



*Say. 9400*

## Our Reason for Being

Service to industry in supplying pipe line equipment carries with it an obligation to provide the most practical and efficient pipe that research and modern mechanical science make possible today.

In supplying Spiralweld Lock-Seam Pipe to industry throughout the world, Naylor Pipe Company builds into this pipe a distinctive rugged yet light weight structure with characteristics of strength, flexibility, leak-tightness and low cost, unobtainable in any other pipe.

The value of this exclusive feature to your requirements for transferring oil, air, gas and water is significantly illustrated on the following pages.

# NAYLOR PIPE COMPANY

*General Offices and Plant*

1230 EAST NINETY-SECOND STREET  
CHICAGO, ILLINOIS *Say. 9400*

### Sales Offices

NEW YORK  
3116 Chrysler Building

PHILADELPHIA  
Witherspoon Building

TULSA  
313 Thompson Building

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1157 Leader Building

OMAHA  
Interstate Machinery Supply Co.  
1006 Douglas Street

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MONTREAL, CAN.  
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660 St. Catherine Street, West

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101 Powell Street

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Neal & Massy Engineering Co., Ltd.  
Port au Spain





## WHAT NAYLOR SPIRALWELD LOCK-SEAM STRUCTURE IS AND WHAT IT MEANS

The basic principle of the Spiralweld Lock-Seam distinguishes Naylor Pipe from all other pipe. As illustrated below, the Naylor Spiralweld Lock-Seam structure, which is an exclusive feature, consists of a continuous electrically welded spiral lock-seam truss extending the full length of the pipe. Maximum structural strength with minimum weight is the motive that engineered the Naylor Pipe structure, however, the continuous welded spiral lock-seam truss provides other structural advantages which, in themselves, are not only unique, but also highly desirable in pipe line construction today.

### FEATURES AND ADVANTAGES

**STRENGTH:** The greatest strength ever built into a pipe structure of equal weight. This added strength of Naylor Pipe resulting from the spiralweld lock-seam structure combined with the safety feature described below enables us to recommend Naylor Pipe for the same working pressures as standard weight wrought pipe.

**LIGHT WEIGHT:** Naylor Pipe weighs half as much as standard weight wrought pipe. Freight, handling and laying costs are lowered materially through its use.



**CROSS SECTION AFTER WELDING.** The "Heel" which, in spiral form, extending for the entire length of the pipe, is responsible for the flexibility of Naylor Pipe. This flexibility provides for expansion and contraction, shock fluid load and vibration which are destructive to a weld on a rigid structure.

The "SPIRALWELD"  
The lock-seam takes the load, thereby relieving the weld of any stress, the weld being only a seal.

**FLEXIBILITY:** The Naylor Spiralweld Lock-Seam structure provides unrivaled flexibility to take care of expansion and contraction under varying temperature changes and ground stress. It is of major importance in pipe line construction since the flexible feature insures close conformity to topographical conditions.

**SAFETY FEATURE:** The illustration above shows the "heel" which, in spiral form, acts as a cushion which absorbs shock fluid loads, vibration, expansion and contraction stresses and strains at all points—relieving and protecting the coupling medium and the body of the pipe itself from the brunt of these forces. This feature is not obtainable in any other pipe.

**WELD STAMINA:** The principal function of the Naylor weld is to seal the pipe leak-tight. The Naylor spiral lock-seam truss relieves the weld of expansion and contraction strains. This is another exclusive property found only in Naylor Pipe.

**PERFECT ROUNDNESS:** Naylor Spiralweld Lock-Seam Pipe is wound on a turned mandrel, which assures a pipe of absolute diameter. The perfect roundness of Naylor Pipe speeds up joining. The ends always match correctly. Coupling or welding is quickly accomplished.

**LONG LIFE:** For long years of service, we recommend use of Naylor Pipe made of Toncan Iron—an alloy of iron, copper and molybdenum with superior corrosion-resisting properties. This means extra years of service life for the pipe, fewer renewals and lower maintenance costs.

**ECONOMY:** While the light weight of Naylor Pipe insures material savings in transportation, handling and laying costs, its true economy becomes apparent only when considering this savings in conjunction with all the exclusive advantages made possible by the spiralweld lock-seam truss structure. Reviewing these advantages makes evident that Naylor offers the maximum of economic pipe values today.

This illustration of Naylor Pipe shows the unique and exclusive Spiralweld Lock-Seam structure which distinguishes it from all other pipe and makes possible the unusual advantages and economies enumerated on this page.

1892

# THE HISTORY OF THE CITY OF BOSTON

BY  
JOSEPH R. COVINGTON





## TEST DATA ON NAYLOR SPIRALWELD LOCK-SEAM STRUCTURE

AUTHORITY: Test data shown here is taken from the test report made on Naylor Pipe by Melvin L. Enger and W. M. Lansford in the Materials Testing Laboratory of the University of Illinois, Urbana, Illinois.



FIGURE 1.—20-inch internal pressure specimen in testing machine during test

### INTERNAL HYDROSTATIC PRESSURES—TABLE I

Diameter of Pipe	Mill Test Lbs. Per Square In.	Diameter of Pipe	Mill Test Lbs. Per Square In.
6" I. D.	900	16" O. D.	400
8" I. D.	800	18" O. D.	350
10" I. D.	700	20" O. D.	325
12" I. D.	500	24" O. D.	300
14" O. D.	450	28" I. D.	235

In the course of these tests it was shown that the bursting strength of Naylor Pipe found by experiment was greater than the bursting strength computed in accordance with the customary formula

$$p = \frac{2 ts}{d}$$

This means that the Naylor Structure is definitely responsible for an increase in resistance to internal hydrostatic pressure.

Every length of Naylor Pipe is tested to the pressures indicated in the above table.

The extensive tests made by M. L. Enger and W. M. Lansford at the University of Illinois bear out the soundness of these mill test pressures.

### EXTERNAL HYDROSTATIC PRESSURES



FIGURE 2—Arrangement used in making external hydrostatic pressure test on 20-inch pipe

Tests made to determine the resistance of Naylor Pipe to external hydrostatic pressure disclose the fact that 84 lbs. per square inch are required to collapse 20-inch Naylor Spiralweld Pipe.

Experiments previously made show that the collapsing pressure for thin steel tubes is represented by the formula

$$p = 50\,200\,000 \left( \frac{t}{d} \right)^3$$

in which  $p$  is the pressure in pounds per square inch required to collapse the pipe, and  $\frac{t}{d}$  is the ratio of the thickness to

the diameter of the pipe. Applying this formula to a pipe without the Spiralweld the collapsing pressure is found to be 19.2 lbs. per square inch. Comparing this with the 84 lbs. per square inch pressure required to collapse Naylor Pipe the effectiveness of the Spiralweld Lock-Seam Truss Structure in stiffening Naylor Pipe against external pressure becomes apparent.

The results of these tests show that Naylor Pipe is admirably suited to vacuum work.





## CRUSHING TESTS ON NAYLOR SPIRALWELD LOCK-SEAM STRUCTURE



FIGURE 3—Specimens used in crushing tests on Naylor Spiralweld Toncan Iron Pipe, after testing.

AUTHORITY: Test data shown here is taken from the test report made on Naylor Pipe by Melvin L. Enger and W. M. Lansford in the Materials Testing Laboratory of the University of Illinois, Urbana, Illinois.

Table II summarizes the results of external crushing tests on Naylor Pipe. The last column in the table gives the computed load required to stress to the yield point a plain pipe of the same thickness as Naylor Pipe. A comparison of these values with the experimental values obtained on Naylor Pipe brings out clearly the stiffening effect of the Spiralweld Lock-Seam. Another feature of Naylor structure disclosed by these tests is its ability to transmit loads at considerable distances along the length of the pipe due to the flexible Spiralweld lock-seam construction, with the result that loads applied to small areas of the pipe would have to reach relatively large values to bring about a collapse of the length which would be affected.



FIGURE 4—Method of making test—20-inch specimen

TABLE II

Results of External Crushing Tests on Naylor *Spiralweld* Toncan Iron Pipe

Diam. In.	Thick- ness In.	Load at Yield Point Lb. per ft.	Vertical Defl. Yield Point In.	Max. Load Lb. per ft.	Computed Load at Yield Point Without Spiral Lock-Seam Lb. per ft.
6	0.109	4000	0.24	7100	1010
12	0.141	2800	0.45	4200	930
20	0.141	1000	0.45	2000	580

THE HISTORY OF THE UNITED STATES OF AMERICA

From the first settlement of the English in America to the present time. By David Ramsay, Esq. of South Carolina. In three volumes. The first volume contains the history from 1607 to 1763. The second volume contains the history from 1763 to 1789. The third volume contains the history from 1789 to the present time.

The first volume of this history contains the history of the United States from the first settlement of the English in America to the year 1763. It is divided into three parts. The first part contains the history of the early settlements, from 1607 to 1675. The second part contains the history of the middle period, from 1675 to 1733. The third part contains the history of the late period, from 1733 to 1763.



# LONGITUDINAL TENSION AND COMPRESSION TESTS ON NAYLOR SPIRALWELD LOCK-SEAM STRUCTURE

AUTHORITY: Test data shown here is taken from the test report made on Naylor Pipe by Melvin L. Enger and W. M. Lansford in the Materials Testing Laboratory of the University of Illinois, Urbana, Illinois.

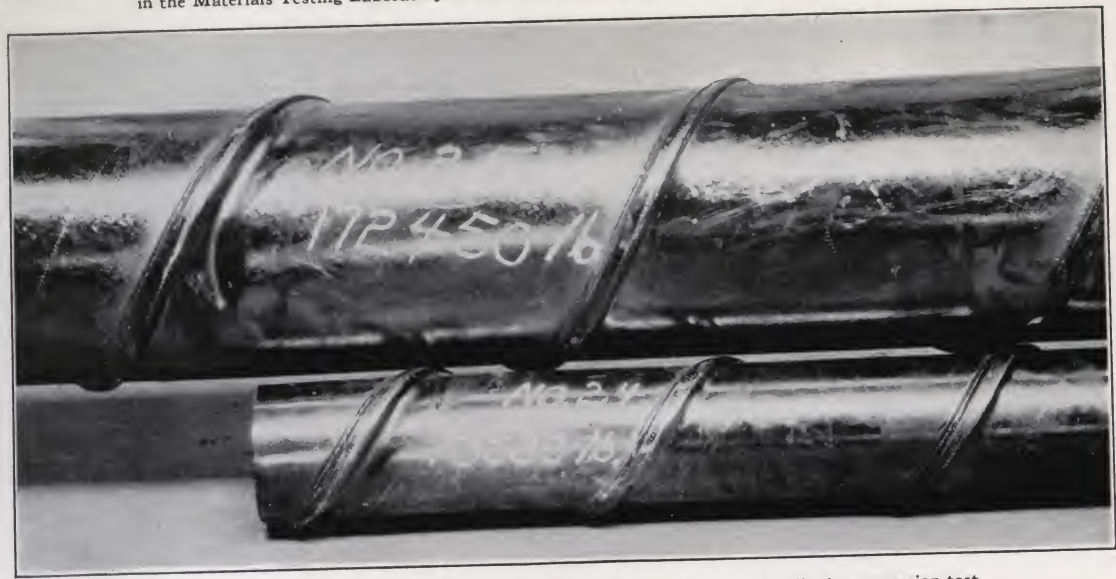


FIGURE 5—6-inch and 12-inch specimens after being subjected to longitudinal compression test.

TABLE III

Results of Longitudinal Tension Tests on Naylor Spiralweld Toncan Iron Pipe

Diam. In.	Area of Cross-Section of Pipe Sq. In.	Load at Yield Point Lb.	Yield Point Lb./Sq. In.	Ult. Load Lb.	Ult. Tensile Strength Lb./Sq. In.	Modulus of Elasticity
6	2.07	80,000	38,600	112,140	54,000	24,000,000
12	5.30	160,000	30,200	254,300	48,000	21,000,000
20	8.85	215,000	24,400	346,000	39,100	20,400,000

TABLE IV

Longitudinal Compression Tests on Naylor Spiralweld Toncan Iron Pipe

Diam. In.	Area of Cross Sect. Sq. In.	Maximum Load Lb.	Max. Comp. Unit Stress Lb./Sq. In.	Modulus of Elasticity
6	2.07	73,000	35,200	25,500,000
12	5.30	172,000	32,500	25,000,000
20	8.85	230,000	26,000	25,000,000

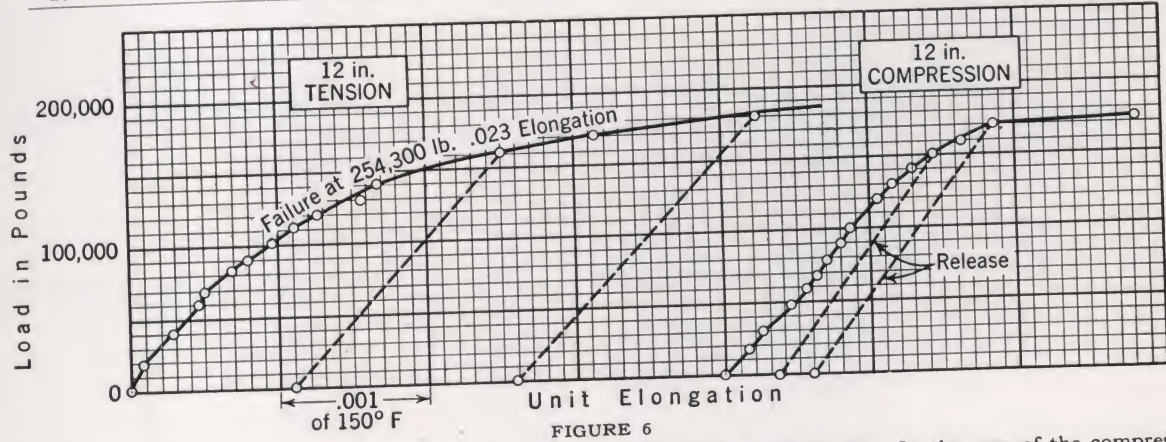
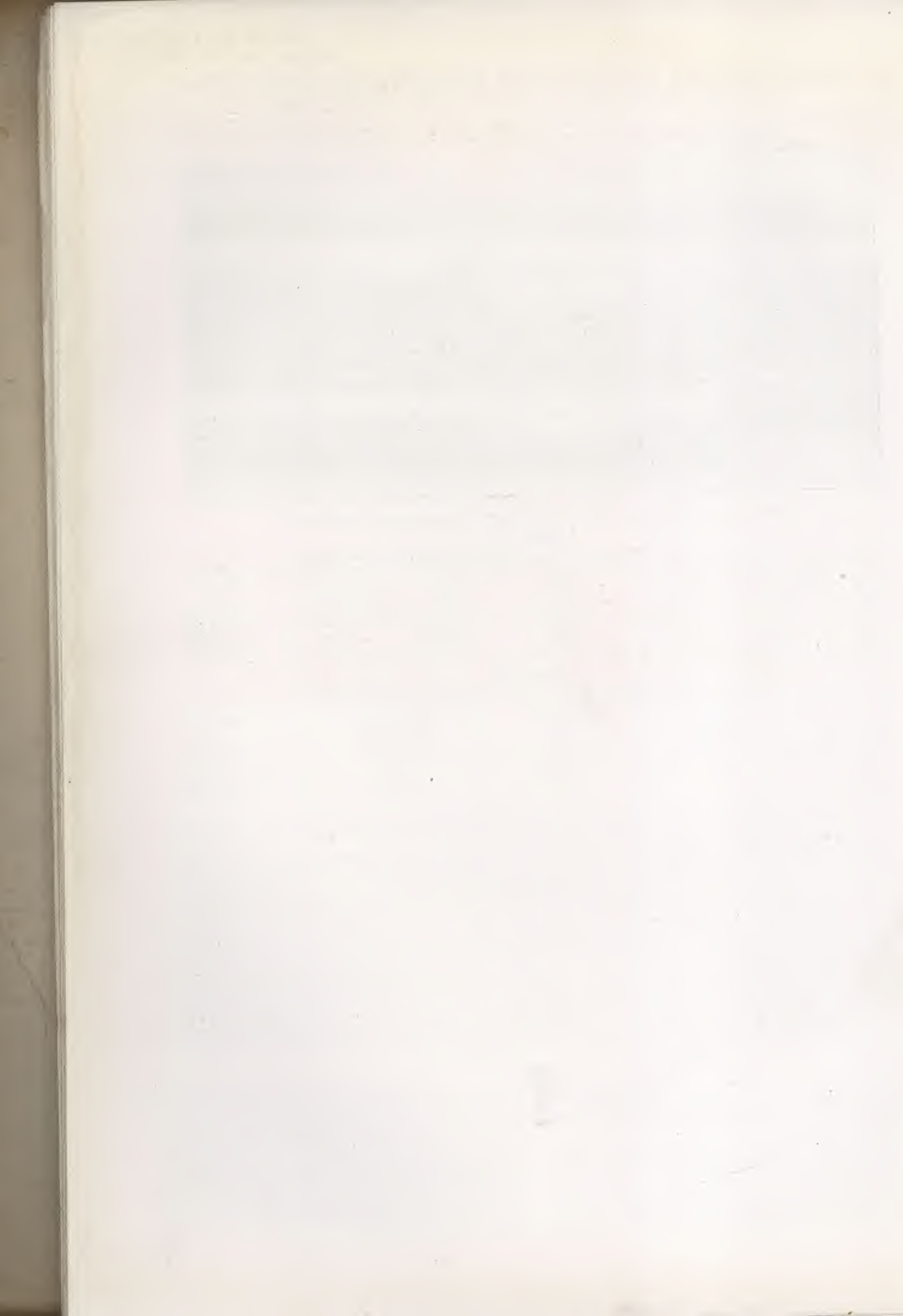


FIGURE 6

Pipes in service are subjected to considerable stresses caused by variations in temperature. The tendency to expand or contract caused by temperature changes may put heavy longitudinal stresses on pipe. The moduli of elasticity which are given in the last columns of Tables III and IV represent the elastic recovery. The pipe is actually much more yielding than is indicated by these figures, but in the case of larger deformations there will be some permanent set. Attention is called to the great elongation of the pipes tested in tension. For example: 12" Naylor Pipe stretched 0.023 inches per inch

at a load of 254,300 lbs. In the case of the compression specimens the deformations are much smaller. In the above chart the load in pounds is plotted against the unit-elongation. Since the unit-elongation is directly proportional to the change in temperature, it is evident that the horizontal scale may also be used as a temperature scale. Steel elongates about 0.001 of an inch per inch for a change of temperature of 150° F. It will be seen from the tension and compression tests that the pipe can withstand large temperature variations without being subjected to heavy temperature stresses.





## NAYLOR SPIRALWELD LOCK-SEAM PIPE CAN BE BENT COLD



FIGURE 7—Cold-bending 6-inch Naylor Pipe

Because of the unusual flexibility of the Spiralweld Lock-Seam structure, you can bend Naylor Spiralweld Pipe using the customary field methods. There is no danger of the seam opening in cold bending. It is often possible to eliminate hot bending and simply bend the pipe cold, thus saving time and money.

As a result of engineering tests, it has been shown that Naylor Pipe can be safely bent as follows:

- 6 inches to minimum radius of 47 feet
- 8 inches to minimum radius of 98 feet
- 10 inches to minimum radius of 120 feet
- 12 inches to minimum radius of 142 feet

## NAYLOR SPIRALWELD PIPE IS ROUND THROUGHOUT ITS ENTIRE LENGTH

Because it is wound on a turned mandrel, Naylor Spiralweld Lock-Seam Pipe is uniformly round and true in diameter. It is precisely true to dimensions and a section taken anywhere throughout its length would be perfectly round.

This perfect roundness is of high value in the field. It speeds up jointing since the ends match perfectly and coupling or welding is therefore accomplished without preliminary work.

All pipe ends of Naylor Spiralweld Pipe are made to

standard weight wrought pipe thickness, which protects the pipe ends from damage in transit and in handling in the field.

The perfect roundness of Naylor Pipe and the smooth interior reduces friction to a minimum.

Exhaustive tests by R. W. Hunt Co., testing engineers, and by Melvin L. Enger and W. M. Lansford show under the Williams and Hazen formula a marked reduction in frictional loss in Naylor Pipe as compared with other pipe.





## UNIT CONSTRUCTION MEANS EXACT LENGTHS—FEWER JOINTS



FIGURE 8—Laying 20-inch O. D. Naylor Spiralweld Lock-Seam Pipe in 40-foot lengths, grooved for Victaulic Couplings.

Naylor Spiralweld Lock-Seam Pipe is furnished at no extra cost in exact uniform lengths of 20, 30 and 40 feet. The joints are exact in length and by using these "units of construction" a bolted coupled line can be broken into wherever necessary at a lower cost than is possible by any other method of pipe line construction. Naylor Spiralweld Pipe lines laid under the "Unit" method have a greater salvage value than any other type of line pipe construction.

## NAYLOR SPIRALWELD LOCK-SEAM PIPE IS LIGHT IN WEIGHT

A comparison in weights of Naylor Pipe and standard wrought pipe reveals practical economies.

Naylor Pipe weighs half as much as standard weight wrought pipe. Its light weight cuts freight costs accordingly, simplifies hauling, and enables fewer men in the field to lay more line with the same effort spent in handling an equivalent weight of standard wrought pipe.

While a comparison of Naylor Pipe with other spiral welded light weight pipe reveals close similarity in weights with attendant advantages in reduced freight, handling and laying costs, the fact remains that only Naylor Pipe has the exclusive Spiralweld Lock-Seam Truss which makes it the strongest, safest, most rugged, most flexible and therefore the most practical light weight pipe for the purpose.





## LONG LIFE VALUES OF NAYLOR SPIRALWELD LOCK-SEAM TONCAN IRON PIPE

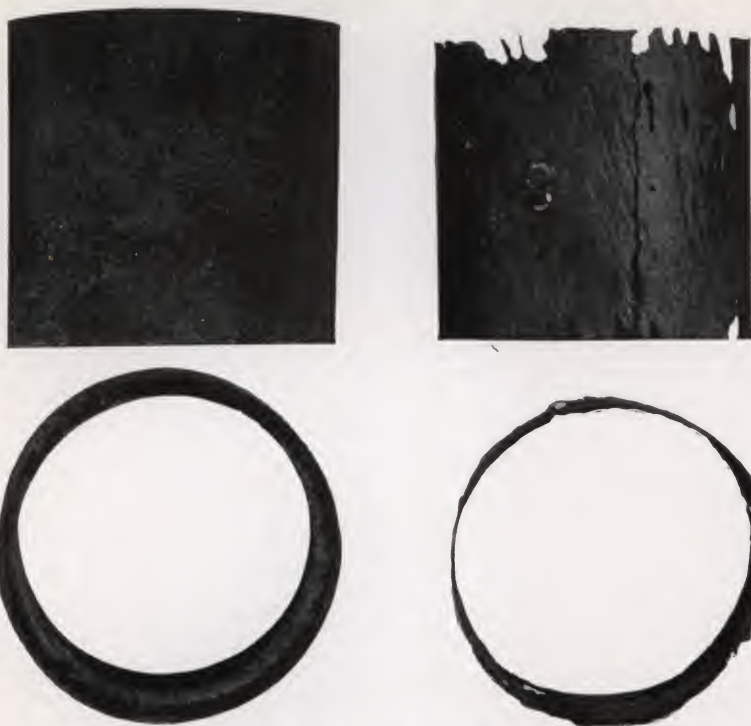


FIGURE 9—Pipe after testing in 20% H<sub>2</sub>SO<sub>4</sub> at room temperature.  
Toncan Iron—21 days—13.4% Steel—21 days—loss 91.0%

### 1. SOLUTION CORROSION

When iron or steel dissolves in a corrosive fluid, this dissolved iron usually precipitates out on the pipe in the form of iron oxide.

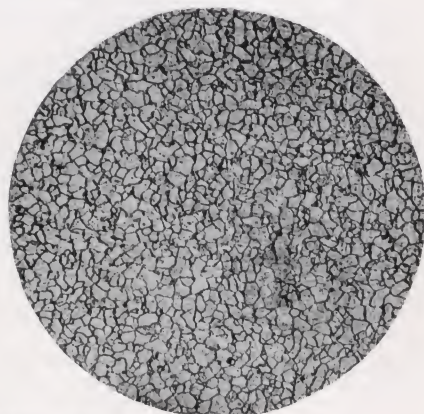
A comparative acid test to show the corrosive action of sulphuric acid on Toncan Iron, pure iron and copper bearing steel, shows the marked superiority of Toncan Iron to resist solution.

This superiority is due to the following:

First: selection of raw material used in manufacture of Toncan Iron is very carefully controlled.

Second: the manufacturing process reduces to a minimum all forms of harmful inclusions and impurities.

Third: the copper and molybdenum alloyed with the pure iron resulting from the above mentioned two features give a close-grained, homogeneous alloy, in which the copper and molybdenum are in solid solution with the iron.



Left—  
Micro Photo  
Toncan Iron

Right—  
Micro Photo  
O. H. Steel

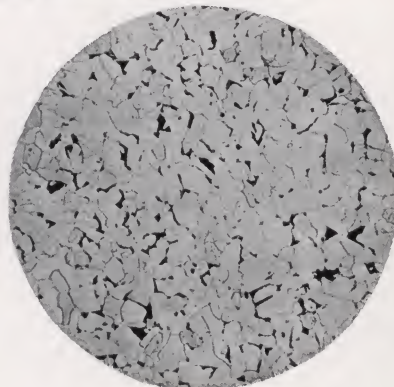


FIGURE 10

### MARCO STRUCTURE

Metallographic investigation shows the Toncan Iron Strip used in the manufacture of Naylor Spiralweld Pipe to have an advantageous physical structure. A cross section shows a rim of exceptional thickness completely surrounding a core of different grain orientation. In Toncan Iron, due to the method of processing and alloy additions this rim comprises approximately half of the total cross section as compared to the relatively thin rim on other ferrous materials not similarly processed nor alloyed.

### ACID SOLUBILITY

Comparative tests show the Toncan Iron to be more resistant to acid corrosion than any part of the cross-section of ordinary steel pipe.

Corrosion is one of the most important problems to consider in the laying of any pipe line.

After careful research, we found Toncan Iron to be the best commercial metal to use in building Naylor Spiralweld Lock-Seam Pipe in order to insure users the maximum life for their pipe lines. We recommend Toncan Iron Pipe to all who want the best.

At the same time, we appreciate that there are many instances where corrosion-resisting material is not a prime factor. Where such is the case, Naylor Spiralweld Pipe can be furnished in open hearth steel.

Engineers agree that there are two forms of corrosion that affect pipe—Solution Corrosion, and Galvanic or Electrolytic Corrosion.





## LONG LIFE VALUES OF NAYLOR SPIRALWELD PIPE (Continued)

### 2. GALVANIC OR ELECTROLYTIC CORROSION

The second form of corrosion, and one which acts very radically and actively is galvanic or electrolytic action. This occurs when two metals of different ranges in the electrolytic series come together in a solution, such as water or weak acid.

We have found after careful research that mill scale is closer to copper in the electromotive series than iron or steel which are relatively high in this series, making quite a wide range in their electrical resistances. When pipe is used without the mill scale being removed, one is very likely to have an erratic pitting due to the flow of current from the base metal thru the solution to the mill scale. This form of action is very rapid and most engineers agree that it is the cause of many failures in pipe lines.

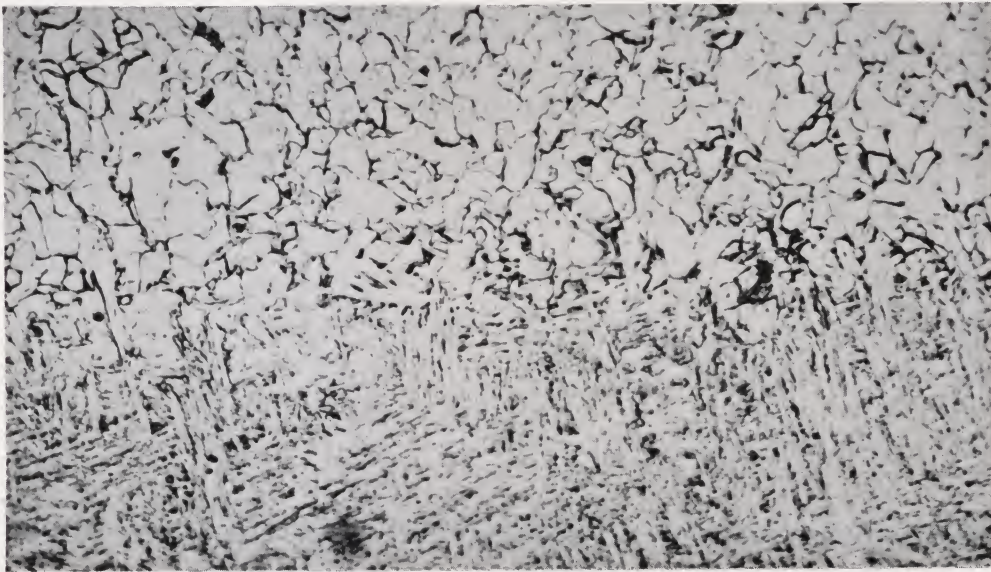


FIGURE 11—This photomicrograph shows the line of junction between the weld material and the Toncan pipe. Note the freedom from oxidation, cold shuts and blow holes and the absence of any structural line of demarcation in the Toncan Iron caused by the welding heat.

The Naylor Pipe Company overcomes this difficulty, first, by using Toncan strip which as manufactured has only a small amount of easily removable mill scale and secondly, this small amount of scale is removed without sacrificing any properties of the base metal.

### CORROSION RESISTANCE

The characteristics of Toncan Iron make it less susceptible to scaling during the heating and rolling operations than ordinary steel or iron not having this protective alloying and processing. In addition when the mill scale is removed from ordinary iron or steel, it tends in greater degree to expose the more porous core of the steel, while in Toncan Iron this condition is not a factor; in the first place, because the rim of Toncan Iron does not allow formation of any but a very superficial layer of mill scale; and in the second place, removal of this mill scale does not in any way impair the corrosion resistance of the pipe because of the great thickness of this rim.

Whereas other pipe will corrode very rapidly once the relatively thin skin has been eaten through, Naylor Pipe is protected by an extremely deep rim of unusually high corrosion resistance.

### TYPICAL ANALYSIS OF TONCAN IRON

Chemical		Physical	
Carbon.....	.04	Ultimate Strength.....	50,000 lbs. per sq. in. min.
Sulphur.....	.021	Yield Point.....	30,000 lbs. per sq. in. min.
Phosphorus.....	.016	Elongation in 2".....	30%
Silicon.....	.050	Reduction of area.....	56%
Copper.....	.51	Rockwell Hardness—B Scale.....	38 to 46
Molybdenum.....	.14		
Manganese.....	.28		





## NAYLOR SPIRALWELD SURFACE CASING



FIGURE 12—Sectional drawing of Naylor Spiralweld Surface Casing.

The new Naylor Spiralweld Surface Casing has been developed to fill the demand for an economical surface casing that will centralize itself in the well.

Here again, the Naylor Spiralweld Lock-Seam Structure offers definite advantages in providing a strong pipe of light weight which can be handled easily on installations and at the same time effect material economies over standard lapweld or seamless surface casing.

Installation and cementing are simplified further by the Naylor Spiralweld Lock-Seam on the outside diameter of the casing, which prevents direct contact between the casing and the wall of the well, insuring a superior cementing job.

Each joint of Naylor Surface Casing is supplied with pipe at each end with sufficient wall thickness for threading according to A. P. I. standards. These heavy ends permit the use of all standard casing equipment in the same manner as ordinary casing.

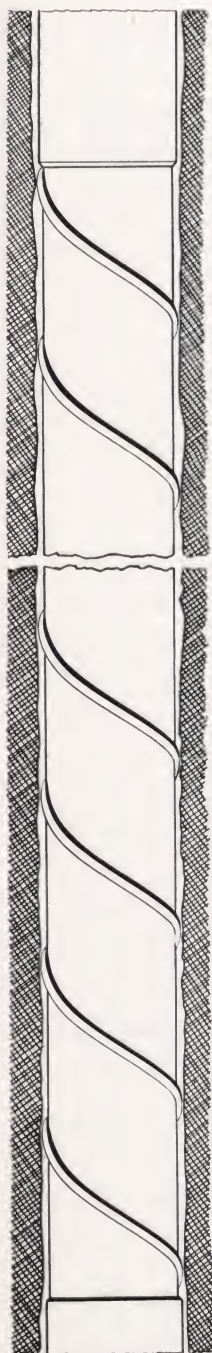


FIGURE 13—View showing how Naylor Spiralweld Lock-Seam Structure centralizes surface casing in well.

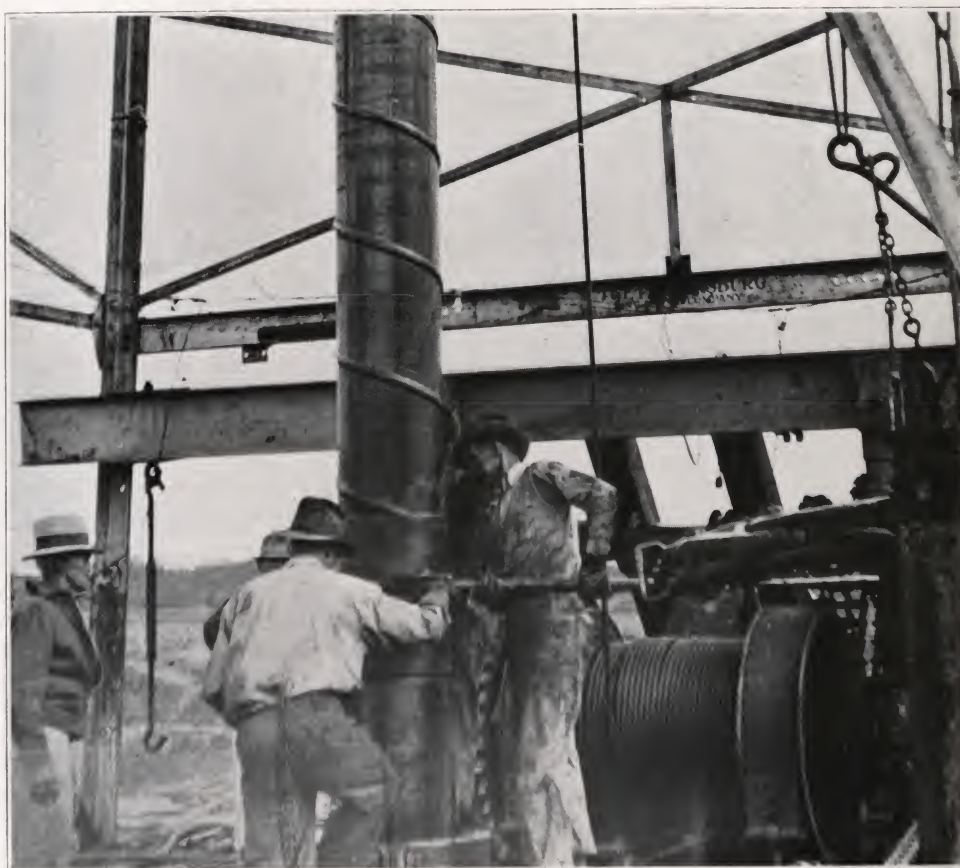
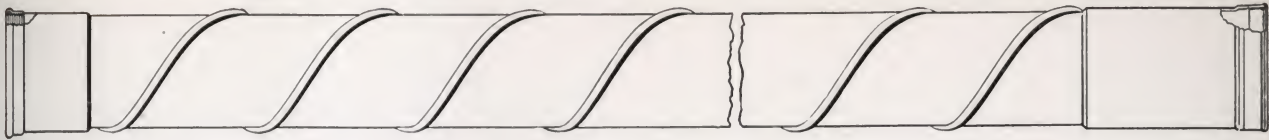


FIGURE 14—Setting 16' O. D. Naylor Spiralweld Surface Casing





SPECIFICATIONS—NAYLOR SPIRALWELD SURFACE CASING



Naylor Surface Casing is made of Open Hearth Steel with both male and female ends threaded to A. P. I. Casing Standards. (See table below.) Prices for Naylor Supplementary Casing will be quoted upon receipt of specifications.

Naylor Casing is made in standard lengths of 20, 25 and 30 feet. The length of Naylor Casing is the made-up coupled length.

CASING SPECIFICATIONS

SIZE IN INCHES							
Nominal O.D.	Actual I.D.	Spiralweld Section	Outside Diameter		Weight Per Foot	Mill Test Press.	Compression Depth-Safety Factor of 2
			Female End	Male End			
10 <sup>3</sup> / <sub>4</sub>	10.0	11.125	11.458	10.75	21.7#	800#	616 ft.
10 <sup>3</sup> / <sub>4</sub>	10.0	11.25	11.458	10.75	23.4#	900#	840 ft.
13 <sup>3</sup> / <sub>8</sub>	12.715	13.84	14.187	13.375	28.9#	600#	303 ft.
13 <sup>3</sup> / <sub>8</sub>	12.715	14.09	14.187	13.375	34.4#	700#	547 ft.
16	15.25	16.375	16.812	16.0	34.0#	500#	176 ft.
16	15.25	16.625	16.812	16.0	40.4#	600#	276 ft.
18 <sup>5</sup> / <sub>8</sub>	17.875	19.0	19.437	18.625	39.6#	425#	115 ft.
18 <sup>5</sup> / <sub>8</sub>	17.875	19.25	19.437	18.625	47.1#	500#	174 ft.

SIZE (Inches) O.D.	NAYLOR SECTION Thickness	SECTION BELOW COUPLING		MALE END	
		Length	Thickness	Length	Thickness
10 <sup>3</sup> / <sub>4</sub>	.1406"	30"	5/16"	16"	3/8"
10 <sup>3</sup> / <sub>4</sub>	.1562"	30"	5/16"	16"	3/8"
13 <sup>3</sup> / <sub>8</sub>	.1406"	30"	5/16"	16"	5/16"
13 <sup>3</sup> / <sub>8</sub>	.1718"	30"	5/16"	16"	5/16"
16	.1406"	30"	5/16"	16"	3/8"
16	.1718"	30"	5/16"	16"	3/8"
18 <sup>5</sup> / <sub>8</sub>	.1406"	30"	5/16"	16"	3/8"
18 <sup>5</sup> / <sub>8</sub>	.1718"	30"	5/16"	16"	3/8"

THREADING SPECIFICATIONS

Size (Inches) O.D.	Threads Per Inch	Thread Taper	Thread Total Length	Thread Effective Length	Thread Perfect Length
10 <sup>3</sup> / <sub>4</sub>	8	3/4	3.625"	3.25"	3.00"
13 <sup>3</sup> / <sub>8</sub>	8	3/4	3.875"	3.50"	3.25"
16	8	3/4	3.875"	3.50"	3.25"
18 <sup>5</sup> / <sub>8</sub>	8	3/4	3.875"	3.50"	3.25"





## NAYLOR SPIRALWELD CEMENT-LINED PIPE

To provide protection against tuberculation and unusual internal corrosive conditions, Naylor can furnish standard Naylor Spiralweld Lock-Seam Pipe with a cement lining.

It is recognized today that the prevention of tuberculation in water supply systems is of considerable economic importance because of the normal tendency of operating costs to increase as capacity is reduced.

Cement lining is also of particular importance in connection with sewerage works involving strict leakage requirements. In a pressure line it is important in preventing a constantly increasing pumping head, and in a gravity line it is of equal importance in reducing permissible gradients, which sometimes reach excessive depths, or obviating the necessity of increasing pipe sizes.

Cement lining affords lasting internal protection for pipe exposed to internal corrosive conditions.

Naylor cement linings are applied by a unique centrifugal process which insures a firm bond to the wall of the cylinder, a uniformity of mixture and thickness, an extreme density and a hard smooth surface—the result of careful research and constant laboratory control.

The Naylor centrifugal process results in an interior surface of a very high degree of smoothness and from experience now available on concrete surfaced pipes of the best grades: Grade "A" gives a value of "C" in the Scobey formula of 0.370 or of Williams and Hazen "C" equals 140 for sizes 18" to 30". For small lines of high velocities values 10 points less should be chosen for Williams and Hazen formula.

Recent freezing tests have been conducted at the laboratory of the Portland Cement Association in Chicago, under the supervision of Dr. Ward and Mr. J. F. Hough, to determine the density and strength of the Naylor cement lining. We quote from their report as follows:

"Test pieces of Naylor Spiral Truss Cylinder 6" I.D., 18" long lined with  $\frac{1}{4}$ " Naylor cement lining were subjected to 30 cycles of freezing and thawing.

"The specimens were first permitted to dry out in the laboratory, aired for several days and then soaked in water for several hours. They were then placed in a covered receptacle in a horizontal position and submerged for half their depth in water.

"The receptacle and specimens were then placed in freezing apparatus and frozen for 20 hours at 20° below zero F.

"After freezing the specimens were thawed in warm water and dried with air in the standard manner. The procedure of freezing and thawing was repeated as described with the same half of pipe submerged in each operation. The results were as follows:

"Slight scaling of the lining at 10 cycles and at the conclusion of 30 cycles the scaling on the cement lining had increased slightly over the amount which started at the end of 10 cycles. However, this scaling only penetrated a very thin surface film on the lining and had little or no affect upon the actual effectiveness of the lining. It amounted to less than one tenth of one per cent."

This test definitely proves the extreme density of the Naylor cement lining under conditions far more severe than would occur in ordinary service.

### THICKNESS OF NAYLOR CEMENT LINING

The standard thicknesses of the Naylor cement lining in the various sizes of Naylor Pipe are as follows:

Nominal Pipe Size	Lining Thickness	Nominal Pipe Size	Lining Thickness
8" Diameter	$\frac{5}{16}$ "	18" Diameter	$\frac{1}{2}$ "
10" "	$\frac{3}{8}$ "	20" "	$\frac{5}{8}$ "
12" "	$\frac{3}{8}$ "	24" "	$\frac{3}{4}$ "
14" "	$\frac{3}{8}$ "	28" "	$\frac{3}{4}$ "
16" "	$\frac{1}{2}$ "	30" "	$\frac{3}{4}$ "

These can be varied to meet individual requirements.

### TYPES OF JOINTS

Naylor Pipe can be furnished equipped for use with Dresser and Victaulic type couplings or with standard flanged joints.

Adapters can be furnished for making up different types of pipe connections.

### PIPE FITTINGS

Standard Cast Iron Fittings or fabricated sheet metal fittings can be furnished with cement lining.

### PIPE LENGTHS

The nominal standard lengths may be taken as 20 feet. Longer or shorter lengths can be furnished to suit the requirements.





## APPLICATIONS—NAYLOR SPIRALWELD PIPE



ACID-RESISTING PIPE (cement-lined)  
AIR LINES  
DISCHARGE PIPE  
DRAINAGE PIPE  
DREDGING PIPE  
EXHAUST STEAM LINES  
GATHERING LINES  
GAS LINES  
GAS GATHERING LINES  
HYDRAULIC MINING  
INTAKE PIPE  
IRRIGATION PIPE  
MINE WATER LINES (cement-lined)  
OIL GATHERING LINES  
OIL PIPE LINES  
PAPER MILL PIPING  
PONTOON PIPE  
PULP LINES  
SALT WATER DISPOSAL LINES (cement-lined)  
SAND AND GRAVEL CONVEYING LINES  
SEWAGE DISPOSAL LINES  
SHORE PIPE  
SLUDGE LINES (cement-lined)  
SURFACE CASING  
TANK GAUGE PIPE  
TANK SWING PIPE  
VACUUM LINES  
VENTILATING PIPE  
WATER LINES (high and low pressure)  
WHITE WATER LINES





## NAYLOR PIPE CONNECTIONS

Naylor Spiralweld Pipe is furnished with flanged joints, with ends prepared for field butt-welding or for bolted coupling joints. Threaded ends or any other type of special connection can be furnished when required.

FOR FLANGE CONNECTIONS, there are the Spiral Pipe Standard Flanges, the American Standard Flanges and the Naylor Rolled Steel Flanges.

The Spiral Pipe Standard flanges are designed for pressures commonly used with spiral pipe and are extensively employed because of their attendant economy. In sizes up to 12 inches, these flanges should not be used for hydraulic pressures over 140 lbs. per square inch, or over 100 lbs. per square inch maximum in sizes 14 inches to 24 inches. See Page 16.

The American Standard flanges are used for higher pressures or wherever it is necessary to connect with standard drilling. See Page 17.



FIGURE 15—Section of welded joint beveled end pipe

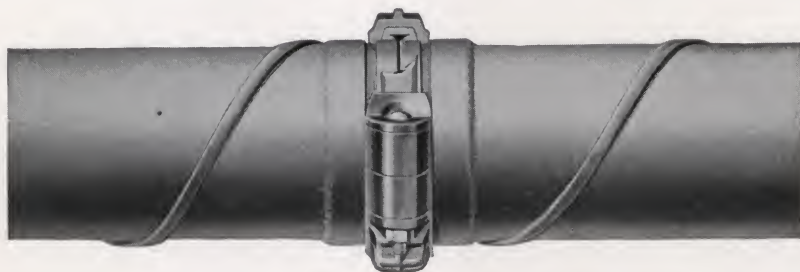


FIGURE 16—Victaulic type grooved end pipe.



FIGURE 17—Dresser type bolted joint coupling.

The Naylor Rolled Steel flanges are light weight angle flanges intended for very low pressure service. Still further economy is effected wherever it is possible to use this connection. See Page 22.

FOR PIPE LINE CONSTRUCTION, Naylor Spiralweld Pipe is furnished with concentric pipe ends of standard weight thickness, either beveled for welding joints in the field, grooved for Victaulic type couplings, or plain for Dresser type bolted couplings.

For field welding, Naylor Spiralweld Pipe can also be furnished without the heavy ends; however, it is preferable to use the heavy beveled ends because they serve as a reinforcement during shipment, save time in aligning joints and insure the advantage of a heavier butt weld.

Pipe ends for use with any of these connections can be furnished for welding to the pipe in the field.





## INFORMATION FOR ORDERING NAYLOR SPIRALWELD PIPE

When inquiring for prices or placing your order, it will be mutually helpful for you to consult the specifications below:

### FOR RECOMMENDATIONS:

To assist us in making an intelligent recommendation, it is essential that you send us the following information.

1. Service in which pipe will be used.
2. Working pressure.
3. Sizes; quantities of each size.
4. Uses: (a) whether for special or high temperature work;  
(b) if for water—whether gravity or pumping and at what head or pressure.
5. Location: (a) buried in ground; (b) laid on surface;  
(c) suspended from structure.

### FOR ORDERING PIPE:

It is important that the specifications below are checked carefully to insure prompt delivery of the proper pipe and fittings.

Specifications	Description
<b>SIZES</b>	From 4 inches to 30 inches in diameter
<b>THICKNESS</b>	From 14 gauge (.078") to 10 gauge (.1406")
<b>MATERIAL</b>	Toncan Iron or Open Hearth Steel
<b>LENGTHS</b>	Standard 20, 30 or 40 feet, or cut to exact length Galvanized Pipe—not longer than 20 feet Mill-coated Pipe—not longer than 40 feet Asphalted Pipe—not longer than 40 feet
<b>CONNECTIONS</b>	Forged Steel Flanges—Spiral Pipe Standard. See Page 16 Forged Steel Flanges—American Standard. See Page 17 Naylor Rolled Steel Flanges. See Page 22 Standard Weight Pipe Ends. Beveled for welding. See Page 13 Standard Weight Pipe Ends—Grooved for Victaulic type couplings. See Page 13 Standard Weight Pipe Ends—Plain for Dresser type couplings. See Page 13 Dredging Pipe—Shore Pipe or Pontoon Pipe
<b>COATINGS</b>	Mill-Coated. Unless otherwise specified, black pipe is mill-coated with Lyne-Kote Primer (a coal tar pitch product) Asphalted Galvanized
<b>CEMENT LINING</b>	See Page 11
<b>FITTINGS</b>	Sheet metal fittings of every description
<b>TESTING</b>	Every length of Naylor Spiralweld Pipe is subjected to the hydraulic mill test pressure shown on Page 15
<b>BOLTS &amp; GASKETS</b>	To meet requirements





## NAYLOR SPIRALWELD LOCK-SEAM PIPE

List prices are subject to discount . . . Prices apply on plain end pipe in uniform lengths of 20 feet, 30 feet or 40 feet—other lengths are subject to an extra charge . . . Extras apply for furnishing pipe with ends of standard wrought pipe thickness either beveled, grooved, or plain . . . Black pipe is furnished with one application of our standard mill coating, unless otherwise specified—coatings, other than standard or galvanizing, are subject to an extra charge . . . Prices on cement lined pipe will be quoted upon request.

Nominal Diameter Inches	Wall Thickness Inches	Weight Pounds	Mill Test Pressure Pounds	List Price Per Foot
* 4	.0781	4.5	900	\$0.36
* 5	.0781	5.7	800	.45
6	.0781	6.8	650	.54
	.1093	9.2	1000	.76
8	.0781	8.5	520	.71
	.1093	12.0	700	.99
	.125	13.2	800	1.13
	.1406	14.5	900	1.27
10	.0781	10.7	400	.89
	.1093	14.0	620	1.24
	.1406	18.0	800	1.59
12	.0781	12.5	320	1.05
	.1093	17.0	500	1.47
	.1406	21.0	640	1.89
14	.0781	14.0	290	1.16
	.1093	19.5	450	1.62
	.1406	25.0	575	2.08
16	.0781	16.0	250	1.32
	.1093	22.0	390	1.85
	.1406	28.0	500	2.38
18	.0781	18.0	210	1.49
	.1093	24.0	330	2.08
	.1406	31.0	425	2.68
20	.0781	20.0	185	1.66
	.1093	27.0	290	2.32
	.1406	34.0	375	2.98
22	.0781	22.0	175	1.82
	.1093	30.0	260	2.55
	.1406	37.5	340	3.28
24	.0781	24.0	150	1.99
	.1093	33.0	230	2.79
	.1406	40.0	300	3.58
26	.1093	36.0	200	3.02
	.1406	43.0	260	3.88
28	.1093	39.0	175	3.28
	.1406	46.0	225	4.22
30	.1093	42.0	150	3.51
	.1406	50.0	200	4.52

\*4" and 5" sizes only available for flanged pipe.

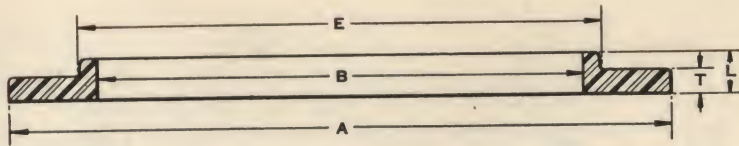
# WATKINS' LITHOGRAPH

This is a copy of the original drawing of the building as it appeared in 1880. The drawing is a perspective view from the south-east corner. The building is a two-story structure with a central gabled section and two side wings. The central section has a prominent chimney on the left side. The drawing is done in a simple, clean style with no shading or texture. The overall impression is that of a technical or architectural drawing.

Room	Area	Volume	Weight	Value
Room 1	100	1000	1000	1000
Room 2	200	2000	2000	2000
Room 3	300	3000	3000	3000
Room 4	400	4000	4000	4000
Room 5	500	5000	5000	5000
Room 6	600	6000	6000	6000
Room 7	700	7000	7000	7000
Room 8	800	8000	8000	8000
Room 9	900	9000	9000	9000
Room 10	1000	10000	10000	10000
Room 11	1100	11000	11000	11000
Room 12	1200	12000	12000	12000
Room 13	1300	13000	13000	13000
Room 14	1400	14000	14000	14000
Room 15	1500	15000	15000	15000
Room 16	1600	16000	16000	16000
Room 17	1700	17000	17000	17000
Room 18	1800	18000	18000	18000
Room 19	1900	19000	19000	19000
Room 20	2000	20000	20000	20000

12'-2" x 1/8" sw  
 2'-2" x 1/2"  
 10'-2" x 1/2"  
 1 1/2' x 7/8"  
 2 1/4"





### \*Spiral Pipe Standard Flanges

Forged and Rolled Steel

For Attaching by Slipping over Pipe and Welding

Nominal Size	Outside Diameter	Thick-ness	Inside Diameter	Length of Hub	Outside Diameter of Hub	Approx. Weight in Pounds	DRILLING TEMPLATE			LIST PRICE, EACH			
							Number of Bolts	Diameter of Bolts	Bolt Circle	Black		Galvanized	
										Attached	Loose	Attached	Loose
Inches	A	T	B	L	E								
3	6	$\frac{3}{8}$	$3\frac{3}{16}$	$\frac{3}{4}$	$3\frac{9}{16}$	2	4	$\frac{1}{2}$	$4\frac{3}{4}$	\$ 1.80	\$ 1.20	\$ 2.00	\$ 1.40
4	7	$\frac{3}{8}$	$4\frac{3}{16}$	$\frac{3}{4}$	$4\frac{11}{16}$	3	8	$\frac{1}{2}$	$5\frac{13}{16}$	2.00	1.40	2.40	1.80
5	8	$\frac{3}{8}$	$5\frac{3}{16}$	$\frac{3}{4}$	$5\frac{3}{4}$	4	8	$\frac{1}{2}$	$6\frac{15}{16}$	2.40	1.80	2.80	2.20
6	9	$\frac{1}{2}$	$6\frac{3}{16}$	$\frac{7}{8}$	$6\frac{3}{4}$	6	8	$\frac{1}{2}$	$7\frac{7}{8}$	2.80	1.90	3.30	2.40
8	11	$\frac{1}{2}$	$8\frac{3}{16}$	$\frac{7}{8}$	$8\frac{3}{4}$	7	8	$\frac{1}{2}$	10	3.80	2.30	4.50	3.00
10	14	$\frac{1}{2}$	$10\frac{1}{4}$	$\frac{7}{8}$	$10\frac{7}{8}$	12	12	$\frac{5}{8}$	$12\frac{1}{4}$	4.60	2.80	5.60	3.80
12	16	$\frac{1}{2}$	$12\frac{1}{4}$	1	$12\frac{7}{8}$	14	12	$\frac{5}{8}$	$14\frac{1}{4}$	5.60	3.40	6.60	4.40
14	18	$\frac{5}{8}$	$14\frac{1}{4}$	$1\frac{1}{8}$	$14\frac{7}{8}$	20	12	$\frac{5}{8}$	$16\frac{1}{4}$	8.00	5.60	9.60	7.20
16	$21\frac{1}{4}$	$\frac{5}{8}$	$16\frac{1}{4}$	$1\frac{1}{8}$	$17\frac{1}{4}$	31	16	$\frac{5}{8}$	$19\frac{1}{4}$	12.00	9.40	14.60	12.00
18	$23\frac{1}{4}$	$\frac{5}{8}$	$18\frac{3}{16}$	$1\frac{1}{8}$	$19\frac{1}{4}$	36	16	$\frac{5}{8}$	$21\frac{1}{4}$	16.00	13.00	19.00	16.00
20	$25\frac{1}{4}$	$\frac{5}{8}$	$20\frac{5}{16}$	$1\frac{1}{8}$	$21\frac{1}{4}$	38	20	$\frac{5}{8}$	$23\frac{1}{8}$	18.00	14.60	23.40	20.00
22	$28\frac{1}{4}$	$\frac{5}{8}$	$22\frac{3}{8}$	$1\frac{1}{8}$	$23\frac{3}{4}$	51	20	$\frac{5}{8}$	26	24.00	20.20	28.20	24.40
24	30	$\frac{3}{4}$	$24\frac{3}{8}$	$1\frac{3}{8}$	$25\frac{3}{4}$	64	20	$\frac{5}{8}$	$27\frac{3}{4}$	28.00	24.00	33.20	29.20
26	32	$\frac{3}{4}$	$26\frac{1}{2}$	$1\frac{3}{8}$	$27\frac{3}{4}$	66	24	$\frac{3}{4}$	$29\frac{3}{4}$	30.00	25.60	35.30	30.90
28	34	$\frac{3}{4}$	$28\frac{1}{2}$	$1\frac{3}{8}$	$29\frac{3}{4}$	71	28	$\frac{3}{4}$	$31\frac{3}{4}$	32.00	27.20	37.80	33.00
30	36	$\frac{3}{4}$	$30\frac{1}{2}$	$1\frac{3}{8}$	$31\frac{3}{4}$	75	28	$\frac{3}{4}$	$33\frac{3}{4}$	34.00	28.80	40.00	34.80

List prices are subject to discount.

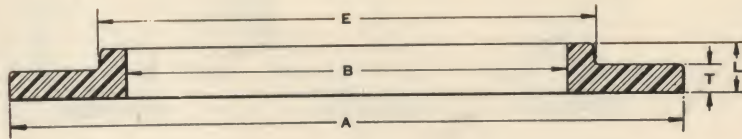
\*Same as Riveted Pipe Manufacturers' Standard, except that certain changes in thickness and drilling have been made for engineering reasons.

Hubs of these flanges are designed for welding—not riveting.

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## \*125-Lb. American Standard Diameter and Drilling

Forged and Rolled Steel

For Attaching by Slipping over Pipe and Welding

Nominal Size	Outside Diameter	Thick- ness	**Inside Diameter	Length of Hub	Outside Diameter of Hub	Approx. Weight in Pounds	DRILLING TEMPLATE			LIST PRICE, EACH			
							Number of Bolts	Diameter of Bolts	Bolt Circle	Black		Galvanized	
Inches	A	T	B	L	E					Attached	Loose	Attached	Loose
3	7½	½	3⅜	⅞	4¼	6	4	⅝	6	\$ 2.40	\$ 1.80	\$ 2.90	\$ 2.30
4	9	½	4⅜	⅞	5⅜	8	8	⅝	7½	2.60	2.00	3.30	2.70
5	10	⅝	5⅜	⅞	6⅜	9½	8	¾	8½	3.20	2.60	4.00	3.40
6	11	⅝	6⅜	1⅞	7⅜	13	8	¾	9½	3.60	2.70	4.70	3.80
8	13½	⅝	8⅜	1⅞	9⅞	18	8	¾	11¾	5.00	3.50	6.50	5.00
10	16	1⅞	10¼	1⅞	12	26	12	⅞	14¼	6.20	4.40	8.30	6.50
12	19	1⅞	12¼	1⅞	14⅜	42	12	⅞	17	8.80	6.60	12.20	10.00
14	21	¾	14¼	1⅞	15¾	44	12	I	18¾	11.00	8.60	14.60	12.20
16	23½	¾	16¼	1½	18	58	16	I	21¼	16.00	13.40	20.80	18.20
18	25	¾	18⅜	1½	19⅞	59	16	1⅞	22¾	20.00	17.00	25.00	22.00
20	27½	¾	20⅜	1½	22	69	20	1⅞	25	22.00	18.60	27.60	24.20
22	29½	I	22⅜	1½	24¼	76	20	1¼	27¼	28.00	24.20	34.30	30.50
24	32	I	24⅜	1⅞	26⅞	113	20	1¼	29½	34.00	30.00	43.20	39.20
26	34¼	I	26½	1⅞	28½	126	24	1¼	31¾	38.00	33.60	47.40	43.00
28	36½	I	28½	1⅞	30½	139	28	1¼	34	40.00	35.20	49.80	45.00
30	38¾	I	30½	1⅞	32½	152	28	1¼	36	44.00	38.80	54.00	48.80

List prices are subject to discount.

\*Light weight Forged Steel to connect with fittings having 125-lb. American Standard Cast Iron Flanges.

\*\*Hubs are of sufficient diameter to permit boring out for slipping over wrought steel pipe.

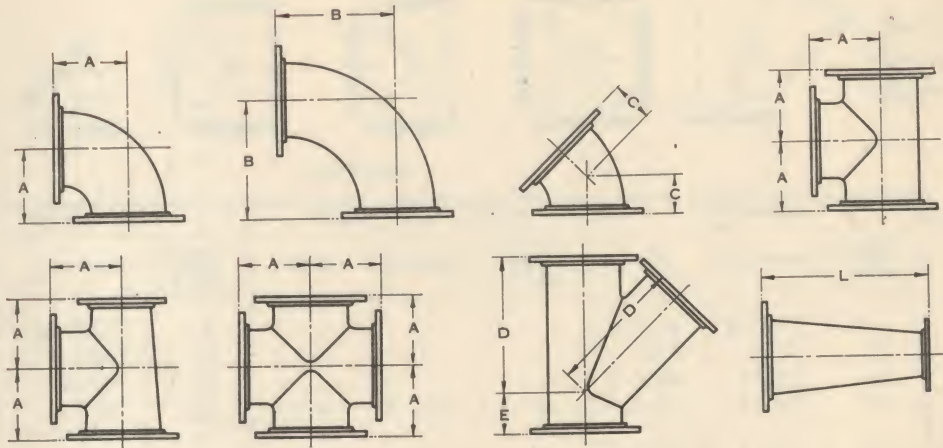
These flanges may also be drilled for the 25-lb. American Standard.

#10 gauge 20' length



# Naylor Fittings for Lightweight Pipe

[ No. 10 Gauge Thickness (.1406") ]



## DIMENSIONS

Nominal Inside Diameter	Center to Face	Center to Face	Center to Face	Center to Face	Center to Face	Face to Face
Inches	A	B	C	D	E	L
3	5½	7¾	3	10	3	6
4	6½	9	4	12	3	7
5	7½	10¼	4½	13½	3½	8
6	8	11½	5	14½	3½	9
7	8½	12¾	5½	16½	4	10
8	9	14	5½	17½	4½	11
10	11	16½	6½	20½	5	12
12	12	19	7½	24½	5½	14
14	14	21½	7½	27	6	16
15	14½	22¾	8	28½	6	17
16	15	24	8	30	6½	18
18	16½	26½	8½	32	7	19
20	18	29	9½	35	8	20
22	20	31½	10	37½	8½	22
24	22	34	11	40½	9	24
26	23	36½	13	44	9	26
28	24	39	14	46½	9½	28
30	25	41½	15	49	10	30

Center to face dimensions of all fittings are the same as the 125-lb. American Standard for Cast Iron. Fittings are furnished flanged Spiral Pipe, Standard unless otherwise ordered; fittings are also furnished plain end for welding or flanged 125-lb. American Standard diameter and drilling. All fittings sizes 16" and smaller are made from No. 10 gauge steel material. Sizes 18" and larger are furnished of a thickness suitable for specific working requirements. Elbows, sizes 16" and smaller (14" and smaller in Long Radius type) are made in two halves with two longitudinal welds; sizes 18" and larger are of segmentally welded construction, the 90° Elbows being made with five segments and the 45° Elbows with three segments.

# Table showing the results of the experiments conducted at the Agricultural Station, 1885.



Diagram	Height of plant (inches)	Weight of head (pounds)	Weight of roots (pounds)	Weight of leaves (pounds)	Weight of seeds (pounds)	Weight of soil (pounds)
A	1.0	0.0	0.0	0.0	0.0	0.0
B	1.5	0.0	0.0	0.0	0.0	0.0
C	2.0	0.0	0.0	0.0	0.0	0.0
D	2.5	0.0	0.0	0.0	0.0	0.0
E	3.0	0.0	0.0	0.0	0.0	0.0
F	3.5	0.0	0.0	0.0	0.0	0.0
G	4.0	0.0	0.0	0.0	0.0	0.0

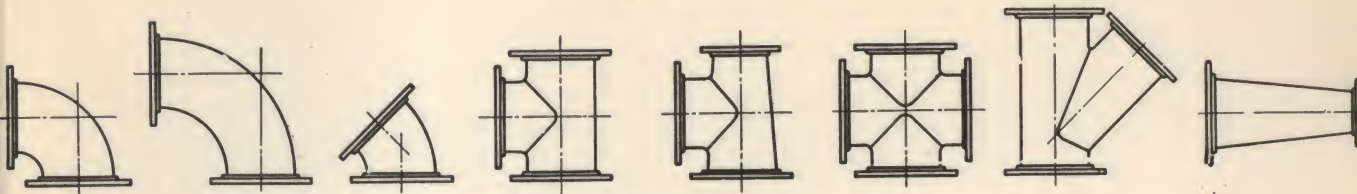
The results of the experiments conducted at the Agricultural Station, 1885, show that the growth of the plant is directly proportional to the weight of the head. The weight of the head increases as the height of the plant increases, and the weight of the roots, leaves, and seeds also increases. The weight of the soil remains constant throughout the experiment.



# Naylor Fittings for Lightweight Pipe

With Spiral Pipe Standard Flanges Attached

No. 10 Gauge Thickness (.1406")



List Prices

Nominal Inside Diameter Inches	90° ELBOWS			90° LONG RADIUS ELBOWS			45° ELBOWS		
	Black	Galvanized	Approx. Weight in Lbs.	Black	Galvanized	Approx. Weight in Lbs.	Black	Galvanized	Approx. Weight in Lbs.
3	\$ 6.00	\$ 6.80	8	.....	.....	...	\$ 6.00	\$ 6.80	7
4	8.00	9.00	12	.....	.....	...	8.00	9.00	10
5	9.00	10.60	18	.....	.....	...	9.00	10.60	14
6	10.00	11.90	25	\$13.50	\$15.90	30	10.00	11.90	20
8	13.00	15.80	33	18.00	21.50	43	13.00	15.80	25
10	20.00	24.00	53	26.00	31.00	67	20.00	24.00	41
12	24.00	29.00	65	33.00	39.20	87	24.00	29.00	51
14	32.00	39.00	90	43.00	52.00	117	32.00	39.00	67
16	44.00	54.00	124	55.00	70.00	160	44.00	54.00	95
18	79.00	97.00	148	90.00	110.00	194	61.00	75.00	112
20	90.00	108.00	168	100.00	125.00	224	70.00	85.00	125
22	100.00	125.00	215	115.00	140.00	280	80.00	98.00	158
24	120.00	145.00	263	135.00	160.00	337	90.00	110.00	195

Nominal Inside Diameter Inches	TEES			LATERALS			REDUCERS		
	Black	Galvanized	Approx. Weight in Lbs.	Black	Galvanized	Approx. Weight in Lbs.	Black	Galvanized	Approx. Weight in Lbs.
3	\$ 8.70	\$10.90	13	\$10.00	\$12.00	15	.....	.....	8
4	10.10	13.00	19	12.00	15.00	23	\$ 9.00	\$10.00	14
5	11.80	14.60	27	14.00	18.00	32	10.00	13.00	16
6	13.00	16.00	37	16.00	20.00	43	12.00	16.00	35
8	17.00	20.00	46	20.00	24.00	62	15.00	20.00	42
10	25.00	30.00	79	28.00	34.00	95	20.00	24.00	58
12	29.00	35.00	97	32.00	40.00	125	24.00	29.00	75
14	41.00	50.00	135	47.00	56.00	168	34.00	40.00	93
16	71.00	86.00	185	76.00	90.00	228	43.00	51.00	114
18	97.00	118.00	222	103.00	123.00	273	62.00	74.00	150
20	108.00	130.00	252	120.00	142.00	313	71.00	84.00	175
22	125.00	150.00	322	130.00	160.00	389	82.00	100.00	210
24	142.00	175.00	395	145.00	180.00	468	100.00	120.00	

List prices are subject to discount.

Center to face dimensions of all fittings are the same as the 125-lb. American Standard for Cast Iron. See page 18  
All fittings sizes 16" and smaller are made from No. 10 gauge steel material. Sizes 18" and larger are furnished of a thickness suitable for specific working requirements.

Elbows, sizes 16" and smaller (14" and smaller in Long Radius type), are made in two halves with two longitudinal welds; sizes 18" and larger are of segmentally welded construction, the 90° Elbows being made with five segments and the 45° Elbows with three segments.

See page 16 for detailed dimensions of flanges.

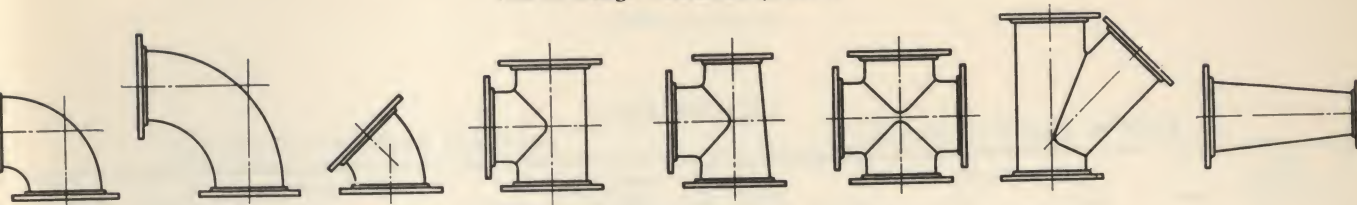




## Naylor Fittings for Lightweight Pipe

With Flanges of American Standard Diameter and Drilling Attached

No. 10 Gauge Thickness (.1406")



List Prices

Nominal Inside Diameter Inches	90° ELBOWS			90° LONG RADIUS ELBOWS			45° ELBOWS		
	Black	Galvanized	Approx. Weight in Lbs.	Black	Galvanized	Approx. Weight in Lbs.	Black	Galvanized	Approx. Weight in Lbs.
3	\$ 7.00	\$ 8.40	16	.....	.....	...	\$ 7.00	\$ 8.40	15
4	9.00	10.70	22	.....	.....	...	9.00	10.70	20
5	11.00	13.40	29	.....	.....	...	11.00	13.40	25
6	12.00	14.60	39	\$ 13.50	\$ 15.60	44	12.00	14.60	34
8	16.00	20.40	55	21.00	26.00	65	16.00	20.40	47
10	24.00	30.00	81	30.00	37.00	95	24.00	30.00	69
12	30.00	39.00	121	39.00	49.00	143	30.00	39.00	107
14	38.00	49.00	138	49.00	62.00	165	38.00	49.00	115
16	50.00	64.00	178	61.00	80.00	214	50.00	64.00	149
18	86.00	108.00	194	97.00	121.00	240	86.00	108.00	158
20	97.00	119.00	230	107.00	137.00	286	97.00	119.00	187
22	108.00	137.00	265	123.00	152.00	330	108.00	137.00	208
24	128.00	157.00	353	143.00	172.00	427	128.00	157.00	285

Nominal Inside Diameter Inches	TEES			LATERALS			REDUCERS		
	Black	Galvanized	Approx. Weight in Lbs.	Black	Galvanized	Approx. Weight in Lbs.	Black	Galvanized	Approx. Weight in Lbs.
3	\$ 10.20	\$ 13.30	25	\$ 11.50	\$ 14.40	27	.....	.....	.....
4	11.60	15.50	34	13.50	17.50	38	\$ 10.00	\$ 11.60	18
5	14.80	17.30	43	17.00	20.70	48	11.00	14.70	25
6	16.00	20.00	58	19.00	24.00	64	14.00	17.80	30
8	21.50	27.00	79	24.50	31.00	95	17.00	24.60	57
10	29.50	39.00	121	32.50	43.00	137	23.00	30.00	70
12	38.00	50.00	181	41.00	55.00	209	27.00	39.00	84
14	50.00	65.00	207	56.00	71.00	240	40.00	50.00	123
16	80.00	101.00	266	85.00	105.00	309	49.00	61.00	147
18	110.00	135.00	291	116.00	140.00	342	68.00	85.00	160
20	121.00	147.00	345	133.00	159.00	406	78.00	95.00	212
22	138.00	168.00	397	143.00	178.00	464	90.00	112.00	225
24	155.00	193.00	530	160.00	198.00	603	108.00	132.00	300

List prices are subject to discount.

Center to face dimensions of all fittings are the same as the 125-lb. American Standard for Cast Iron. See page 18  
All fittings sizes 16" and smaller are made from No. 10 gauge steel material. Sizes 18" and larger are furnished of a thickness suitable for specific working requirements.

Elbows, sizes 16" and smaller (14" and smaller in Long Radius type), are made in two halves with two longitudinal welds; sizes 18" and larger are of segmentally welded construction, the 90° Elbows being made with five segments and the 45° Elbows with three segments.

See page 17 for detailed dimensions of flanges.





# Naylor Bolts and Gaskets

For Flanged Joints

## LIST PRICES

### Spiral Pipe Standard Drilling

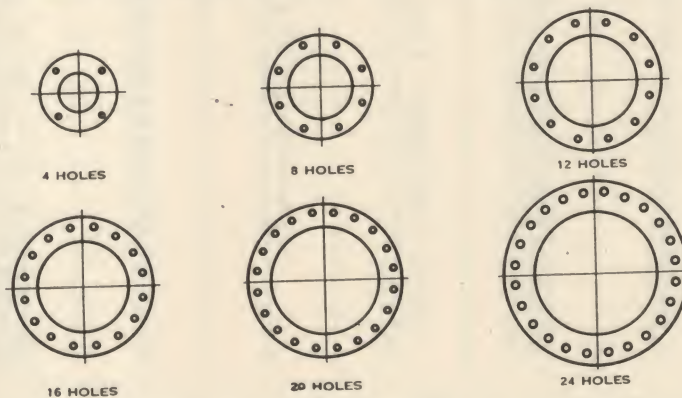
### American Standard Drilling

Pipe Size	Number	Bolts, Per Set Size	Weight	List Price	Full Face Gaskets *Rubber, Ea.	Pipe Size	Number	Bolts, Per Set Size	Weight	List Price	Ring Gaskets *Rubber, Ea.
3"	4	1/2 x 1 1/2"	.8#	\$0.20	\$0.17	3"	4	5/8 x 1 3/4"	1.5#	\$0.37	\$0.17
4"	8	1/2 x 1 1/2"	1.6#	.40	.20	4"	8	5/8 x 1 3/4"	3.0#	.73	.20
5"	8	1/2 x 1 1/2"	1.6#	.40	.25	5"	8	3/4 x 2"	4.8#	.93	.25
6"	8	1/2 x 1 3/4"	1.7#	.43	.30	6"	8	3/4 x 2"	4.8#	.93	.30
8"	8	1/2 x 1 3/4"	1.7#	.43	.45	8"	8	3/4 x 2"	4.8#	.93	.45
10"	12	5/8 x 1 3/4"	4.4#	1.10	.80	10"	12	7/8 x 2 1/2"	11.9#	2.22	.80
12"	12	5/8 x 1 3/4"	4.4#	1.10	.95	12"	12	7/8 x 2 1/2"	11.9#	2.22	.95
14"	12	5/8 x 2"	4.6#	1.10	1.05	14"	12	1 x 3"	19.1#	3.21	1.05
16"	12	5/8 x 2"	4.6#	1.10	1.65	16"	12	1 x 3"	25.5#	4.28	1.65
18"	16	5/8 x 2"	6.2#	1.46	1.85	18"	16	1 1/8 x 3"	33.0#	7.35	1.85
20"	20	5/8 x 2"	7.7#	1.82	2.00	20"	20	1 1/8 x 3"	41.2#	9.18	2.00
22"	20	5/8 x 2"	7.7#	1.82	2.70	22"	20	1 1/4 x 3 1/2"	57.8#	11.22	2.70
24"	20	5/8 x 2 1/4"	8.1#	1.92	2.80	24"	20	1 1/4 x 3 1/2"	57.8#	11.22	2.80
26"	24	3/4 x 2 1/2"	16.0#	2.94	3.00	26"	24	1 1/4 x 3 1/2"	69.4#	13.47	3.00
28"	28	3/4 x 2 1/2"	18.5#	3.43	3.25	28"	28	1 1/4 x 3 1/2"	81.0#	15.70	3.25
30"	28	3/4 x 2 1/2"	18.5#	3.43	3.40	30"	28	1 1/4 x 3 1/2"	81.0#	15.70	3.40

List prices are subject to discount.  
\*Gaskets of other materials also furnished.

## Standard Drilling for Pipe Fittings

All fittings are drilled straddle center lines in accordance with standard practice.



For drilling dimensions, Spiral Pipe Standard, see page 16.  
For drilling dimensions, American Standard, see page 17.





# NAYLOR ROLLED STEEL FLANGES

## FOR LIGHT WEIGHT SHEET METAL WORK



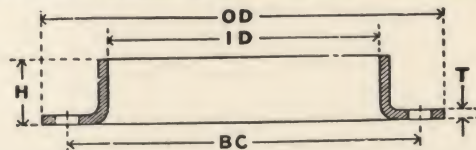
Naylor Rolled Steel Flanges show a marked saving over ordinary light weight rolled angle iron flanges. Being rolled by patented process from flat stock, they are true in all dimensions and uniform in circumference, simplifying the layout of the bolt circle, and insuring uniform centers and bolt-holes.

They are absolutely uniform in diameter, and eliminate the costly swedging of pipe so often necessary when ordinary angle iron flanges are used.

Made with true, square faces, they can be readily drawn up to a thin gasket, and guarantee a tight joint under any normal condition.

Naylor Rolled Steel Flanges are carried in stock for immediate shipment, and because they are produced in large quantities, may be had at a price equal or below that of angle iron flanges. A trial order will convince you of the merits of this special Naylor product.

Table of Standard Sizes Carried in Stock



Nominal Size, Inches	Actual Inside Diameter I. D.	Outside Diameter Inches O. D.	Decimal Thickness Inches T.	Height Inches H	Approx. Weight, Each	List Price Each Not Drilled	No. of Bolts	Size of Bolts	Diam. of Bolt Circle B. C.
6	6 1/8	9	3/16	1 1/2	3	\$1.50	8	1/2	7 7/16
7	7 1/8	10	3/16	1 1/2	3 3/8	1.75	8	1/2	8 9/16
8	8 3/16	10 3/4	3/16	1 1/2	4 1/2	2.00	8	1/2	10
9	9 7/16	12	3/16	1 1/2	5 1/4	2.10	8	1/2	11 1/4
10	10 3/16	13 3/8	3/16	1 5/8	6	2.20	8	1/2	12 1/4
10 1/2	10 11/16	14	3/16	1 5/8	6 1/4	2.25	8	1/2	12 3/4
11	11 3/16	14 1/2	3/16	1 5/8	6 1/2	2.30	12	1/2	13 3/8
11 1/2	11 11/16	15	3/16	1 5/8	6 3/8	2.35	12	1/2	13 3/4
*12	12 3/16	15 1/2	3/16	1 3/4	6 3/4	2.40	12	1/2	14 1/4
*12 1/2	12 11/16	16	3/16	1 3/4	7 1/4	2.45	12	1/2	14 3/4
*13	13 3/16	16 1/2	3/16	1 3/4	7 1/2	2.50	12	1/2	15 1/4
*14	14 3/16	17 1/2	3/16	1 3/4	8 1/4	2.60	12	1/2	16 1/4
*15	15 3/16	18 3/4	3/16	1 3/4	9	2.70	16	1/2	17 7/16
16	16 1/4	20 1/4	1/4	2	12 1/2	2.80	16	1/2	18 3/8
18	18 1/4	22 1/4	1/4	2	15 1/2	3.00	16	1/2	20 3/8
20	20 1/4	24 1/4	1/4	2	17 1/2	3.20	20	1/2	22 3/8
22	22 1/4	26 1/4	1/4	2	19 1/4	3.40	20	1/2	24 3/8
24	24 1/4	28 1/4	1/4	2	21	3.60	20	1/2	26 3/8

\*When desired 12 to 15 inch flanges can be furnished from 1/4 inch stock, making hub and face 2 inches and increasing O.D. 3/4 inches. Naylor Standard Light Weight Steel Flanges are furnished either plain or drilled. If wanted drilled add 10% to prices above. Special Sizes furnished promptly.





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